

member to be eliminated when the separator is incorporated into a fuel cell.

REMARKS

Claims 1-3, 5-8 and 11-12 stand rejected under 35 U.S.C. § 103(a) as unpatentable over U.S. Patent No. 4,956,131 to Shigeta, *et al.* ("Shigeta") in view of JP 69042781.

In addition, claims 4, 9 and 10 stand objected to as being dependent on a rejected base claim, but are identified as being allowable if rewritten to incorporate all the limitations of the base and intervening claims.

The Applicant has reviewed the May 18, 2001 Office Action, and respectfully submits the foregoing amendments and following remarks in response thereto. The Applicant is grateful for the Examiners' indication that claims 4, 9 and 10 would be allowable if amended to incorporate the limitations of their respective base and intervening claims. These claims have been amended in the manner suggested. The Applicant has also amended claim 1 to clarify the relationship between the hydroxyl group of the phenolic resins and the epoxy group of the epoxy resins that results in the present invention's ability to produce improved separators free from the presence of significant amounts of separator-weakening voids created by reaction byproduct gas bubbles.

In view of the foregoing amendments and following remarks, the Applicants respectfully request reconsideration of the pending rejections and allowance of claims 1-12.

1. The Present Invention Is Patentable Over Shigeta and JP 59042781.

The Applicant respectfully traverses the § 103(a) rejection of claims 1-3, 5-8 and 11-12 on the grounds that the cited references do not teach or suggest all the features of the present invention recited in independent claim 1, as amended.

Claim 1 has been amended to more clearly describe one of the features of the present invention, the control of the amount of hydroxyl group and the amount of epoxy group present in the raw material mixture in a manner which results in improved separator strength by essentially eliminating the generation of reaction byproduct gases which can create voids and thereby weaken the separator. The pertinent portion of amended claim 1 thus now reads "preparing a raw material by mixing a carbon, an epoxy resin and a phenolic resin, wherein said phenolic resin is different from said epoxy resin, and further wherein an amount of a hydroxyl group of said phenolic resin in the raw material mixture is sufficient to react with an

amount of an epoxy group of said epoxy resin in the raw material mixture such that generation of a reaction byproduct gas is minimized.” Amended Claim 1, lines 3-7.

The Applicant respectfully submits that neither JP 59042781 nor Shigeta teach nor suggest the foregoing aspect of amended claim 1; indeed, neither reference even mentions the problems of reaction byproduct gas and void generation. In fact, Shigeta teaches away from the present invention, inasmuch as it teaches material compositions specifically designed to obtain *gas porous* separators, *i.e.*, separators with significant void fractions. *See, e.g.*, Shigeta at 8:26-9:10 (discussing processes which create gas permeable separators, without mention of reaction byproduct gases; n.b. Shigeta’s references to a “reactant gas” are to the fuel gases fed into the assembled fuel cell to generate power).

Because neither Shigeta and JP 59042781, alone or in combination, teach or suggest the foregoing feature recited in amended claim 1, claim 1 and its dependent claims 2-3, 5-8 and 11-12 are patentable over these references under § 103(a). The Applicant thus respectfully requests entry of the foregoing amendments and reconsideration and withdrawal of the pending § 103(a) rejections of claims 1-3, 5-8 and 11-12.

Conclusion

In view of the foregoing amendments and remarks, it is respectfully submitted that entry of the proposed amendments would place the presently pending claims in condition for allowance. The Applicant therefore earnestly solicits entry of the amendments and issuance of a Notice of Allowance for claims 1-12.

The Examiner is invited to contact the undersigned to discuss any matter concerning this application.

Applicants respectfully request a one-month Extension of Time to respond to the Office Action of December 5, 2000. The extended period expires April 5, 2001. The Office is hereby authorized to charge the fee of \$110.00 for a Petition for Extension of Time Under 37 C.F.R. § 1.136(a) and any additional fees under 37 C.F.R. § 1.16 or § 1.17 or credit any

overpayment to Deposit Account No. 11-0600.

Respectfully submitted,



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MARKED UP VERSION OF AMENDED CLAIMS

1. (Twice amended) A method of manufacturing a separator for a fuel cell comprising:

preparing a raw material by mixing a carbon, an epoxy resin and a phenolic resin, wherein said phenolic resin is different from said epoxy resin, and further wherein an amount of a hydroxyl group of said phenolic resin in the raw material mixture is sufficient to react with an amount of an epoxy group of said epoxy resin in the raw material mixture such that generation of a reaction byproduct gas is minimized;

charging the raw material into a predetermined mold; and
heat press forming the raw material charged into the mold.

4. (Twice Amended) A method [according to claim 1] of manufacturing a separator for a fuel cell comprising:

preparing a raw material by mixing a carbon, an epoxy resin and a phenolic resin, wherein said phenolic resin is different from said epoxy resin;

charging the raw material into a predetermined mold; and
heat press forming the raw material charged into the mold,
wherein the epoxy resin comprises a glycidylamine epoxy resin.

9. (Once Amended) A method [according to claim 1] of manufacturing a separator for a fuel cell comprising:

preparing a raw material by mixing a carbon, an epoxy resin and a phenolic resin, wherein said phenolic resin is different from said epoxy resin;

charging the raw material into a predetermined mold; and
heat press forming the raw material charged into the mold,
wherein the step of preparing the raw material includes the substeps of:

forming the raw material into a slurry; and
preparing a powder having an average particle size ranging from 50 to 150 μm and a particle size distribution ranging from 50 to 300 μm by spraying and drying the slurry for granulation.

10. (Once Amended) A method [according to claim 1, further comprising the step of:]
of manufacturing a separator for a fuel cell comprising:

preparing a raw material by mixing a carbon, an epoxy resin and a phenolic resin,
wherein said phenolic resin is different from said epoxy resin;
charging the raw material into a predetermined mold;
heat press forming the raw material charged into the mold; and
grinding a surface of the separator which is brought into contact with an adjacent member to be eliminated when the separator is incorporated into a fuel cell.